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SAMSUNG

ELECTRONICS

Product information

Customer : Gen

ISSUED DATE : Jul. 06, 2009

SAMSUNG TFT-LCD

MODEL : LTA550HF03

Any Modification of Specification is not allowed without SEC's Permission.

NOTE :

Customer's Approval

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DATE

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LCD Business

Samsung Electronics Co . , LTD.

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*** Revision History**

Date	Rev. No	Page	Summary
Apr 28,2009	000	All	First issued
Jun 22,2009	001	12	PS On Floating Min TBD→ 0.8V
			Test equipment DC probe→ AC probe
			BLU On/Off 1.On Floating Min. TBD→ 0.8V 2.Off Low (GND) Max 0.8v→ 0.3v
July 6,2009	002	12	LED LIPS Condition & Specification
		18	LED LIPS Power ON/OFF Sequence Stan-by condition

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General Description

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Description

LTA550HF03 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT (Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit.

The resolution of a 55.0" is 1920 x 1080 and this model can display up to 1.06 Billion colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide an excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV and High Definition TV.

Features

- RoHS compliance (Pb-free)
- High contrast & aperture ratio
- SPVA (Super Patterned Vertical Align) mode
- Wide viewing angle ($\pm 178^\circ$)
- High speed response (120Hz)
- FHD resolution (16:9)
- Low Power consumption
- White LED Backlight
- DE (Data Enable) mode
- LVDS (Low Voltage Differential Signaling) interface

General Information

Items	Specification	Unit	Note
Module Size	1267.6(H _{TYP}) x 744.4(V _{TYP})	mm	±1.0mm
	29.6(D _{TYP})		±1.0mm
Weight	17,000 (Max.)	g	
Pixel Pitch	0.630(H) x 0.630(W)	mm	
Active Display Area	1209.6(H) X 680.4(V)	mm	
Surface Treatment	Antiglare, Hard-coating(3H)	-	
Display Colors	10bit (FRC) – 1.06Billion	Colors	
Number of Pixels	1920 x 1080	Pixel	
Pixel Arrangement	RGB vertical stripe	-	
Display Mode	Normally Black	-	
Luminance of White	450 (Typ.)	cd/m ²	

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1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

1.1 Back Light Unit Absolute Maximum Ratings

Item		Symbol	Min.	Max.	Unit	Note
Power Supply Voltage		V_{DD}	GND-0.3	13	V	(1)
Storage temperature		T_{STG}	-20	60	°C	(2)
Glass surface temperature (Operation)	Center	T_{OPR}	0	50	°C	(2)
Shock (non - operating)		S_{nop}	-	30	G	(3)
Vibration (non - operating)		V_{nop}	-	1.5	G	(4)

1.2 LED Unit Absolute Maximum Ratings

Item	Symbol	Max.	Unit	Note
Operating Temperature Range	T_{op}	-20~+70	°C	-
Storage Temperature Range	T_{STG}	-30~+70	°C	-
Junction Temperature	T_j	110	°C	-
Forward Current	I_f	0.18	A	Continuous operation @String (2string /1Bar)
	I_{fp}	0.24	A	Duty 35% operation @String (2string /1Bar)
Forward Voltage	V_f	215.2	V	Continuous operation @String (31 LEDs / 1String)
	V_{fp}	220	V	Impulsive operation @String (31 LEDs / 1String)
Thermal Resistance, Junction to PCB	$R_{th,JS}$	<65K/W	K/W	-

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Note (1) $T_a = 25 \pm 2^\circ\text{C}$

(2) Temperature and relative humidity range are shown in the figure below.

a. 90 % RH Max. ($T_a \leq 39^\circ\text{C}$)

b. Relative Humidity is 90% or less. ($T_a > 39^\circ\text{C}$)

c. No condensation

(3) 11ms, sine wave, one time for $\pm X$, $\pm Y$, $\pm Z$ axis

(4) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis

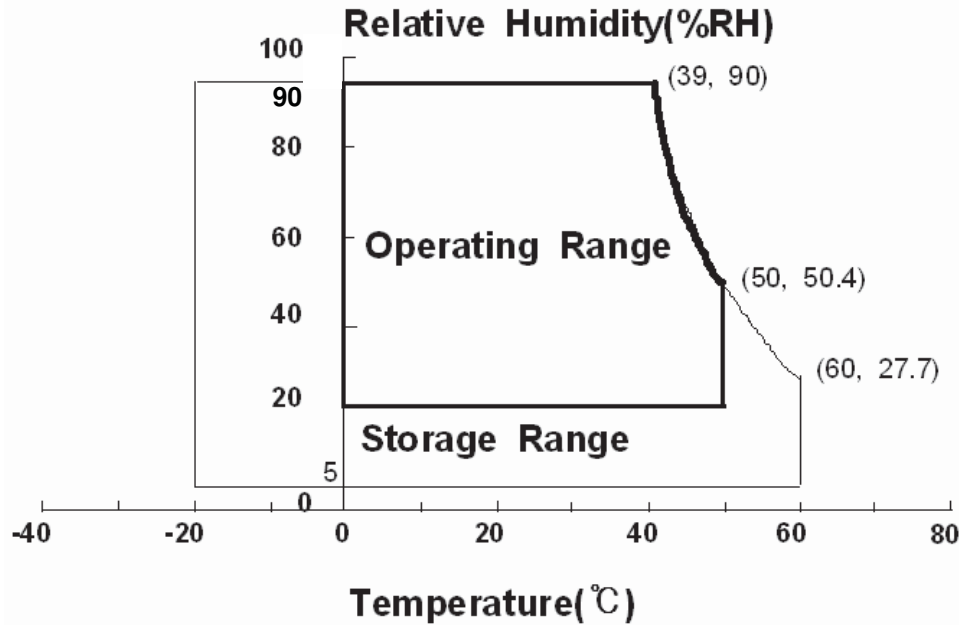


Fig. Temperature and Relative humidity range

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2. Optical Characteristics

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The optical characteristics should be measured in a dark room or equivalent.

Measuring equipment : TOPCON RD-80S, TOPCON SR-3 ,ELDIM EZ-Contrast

(Ta = 25 ± 2 °C, VDD=12.0V, fv=120Hz, f_{DCLK}=297MHz, LED current =110mA)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R	Normal $\theta_{L,R}=0$ $\theta_{U,D}=0$ Viewing Angle	4,000	5,000	-	-	(1) SR-3
Response Time	G-to-G	Tg		-	6	10	msec	(3) RD-80S
Luminance of White (Center of screen)		Y _L		400	450	-	cd/m ²	(4) SR-3
Color Chromaticity (CIE 1931)	Red	R _x		TYP. -0.03	0.650	TYP. +0.03		(5),(6) SR-3
		R _y			0.330			
	Green	G _x			0.285			
		G _y			0.635			
	Blue	B _x			0.150			
		B _y			0.057			
	White	W _x			0.280			
		W _y	0.290					
Color Gamut		-	-	80	-	%	(5) SR-3	
Color Temperature		-	-	10,000	-	K		
Viewing Angle	Hor.	θ _L	C/R≥10	75	89	-	Degree	(6) EZ-Contrast
		θ _R		75	89	-		
	Ver.	θ _U		75	89	-		
		θ _D		75	89	-		
Brightness Uniformity (9 Points)		B _{uni}		-	-	25	%	(2) SR-3

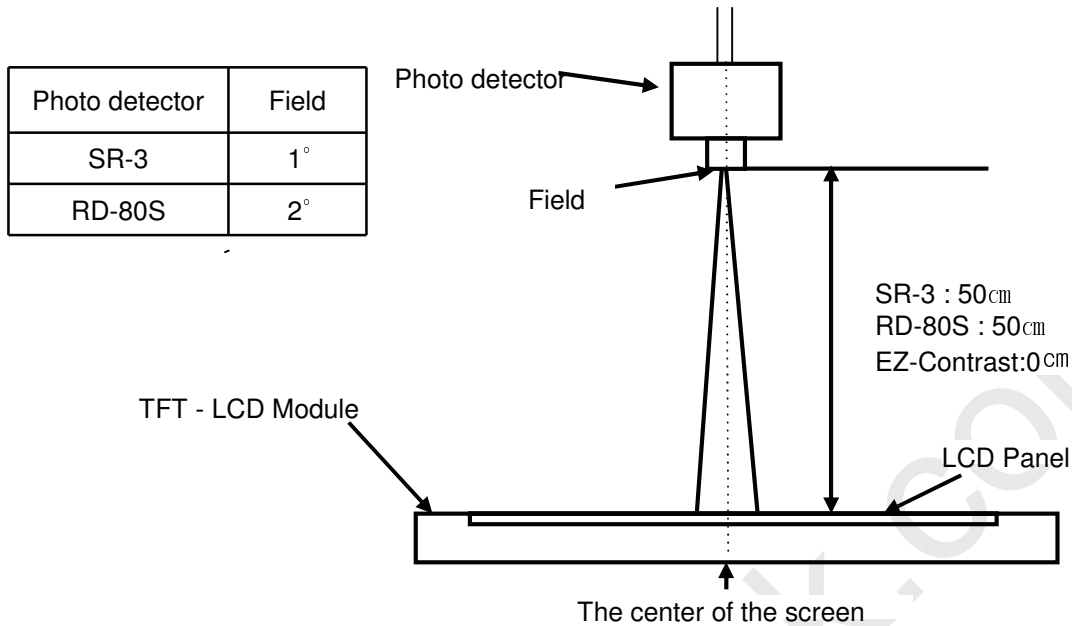
- Test Equipment Setup

The measurement should be executed in a stable, windless and dark room between 40min and 60min after lighting the back light at the given temperature for stabilization of the back light. This should be measured in the center of screen.

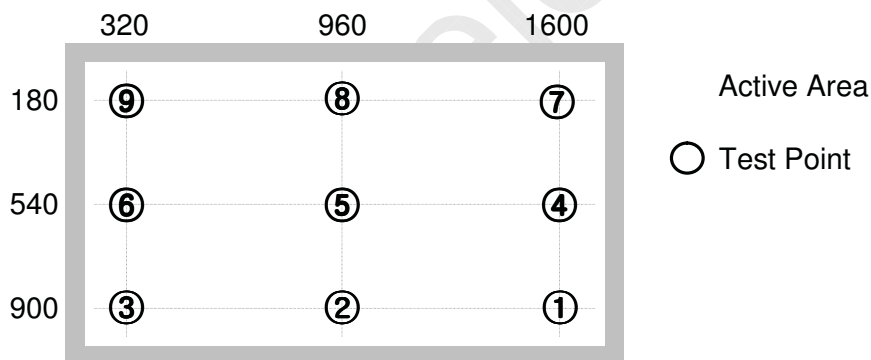
- . LED current = 110mA (for 1EA LED bar)
- . Environment condition : Ta = 25 ± 2 °C

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- Definition of test point



Note (1) Definition of Contrast Ratio (C/R)

: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C/R = \frac{G_{\max}}{G_{\min}}$$

Gmax : Luminance with all pixels white

Gmin : Luminance with all pixels black

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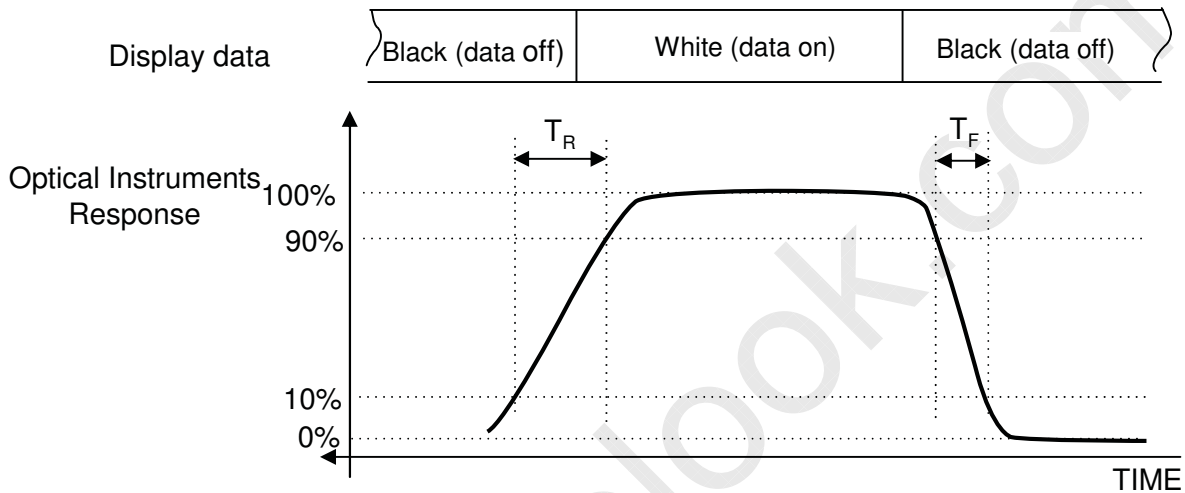
Note (2) Definition of 9 points brightness uniformity (Test pattern : Full White)

$$B_{uni} = 100 * \frac{(B_{max} - B_{min})}{B_{max}}$$

B_{max} : Maximum brightness

B_{min} : Minimum brightness

Note (3) Definition of Response time : Sum of T_r, T_f



※ G-to-G : Average response time between Gray to Gray (Scale)

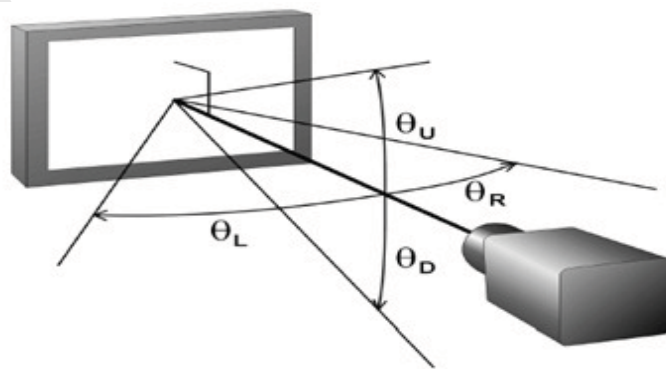
Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

Note (5) Definition of Color Chromaticity (CIE 1931)

Color coordinate of Red, Green, Blue & White at center point ⑤

Note (6) Definition of Viewing Angle

: Viewing angle range (C/R ≥ 10)



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3. Electrical Characteristics

3.1 TFT LCD Module

The connector for display data & timing signal should be connected.

$T_a = 25^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V _{DD}	10.8	12.0	13.2	V	(1)
Current of Power Supply	(a) Black	I _{DD}	-	1800	2000	mA	(2),(3)
	(b) White		-	1800	2000	mA	
	(c) H-STRIPE		-	3200	3500	mA	
Vsync Frequency		f _v	90	120	125	Hz	
Hsync Frequency		f _H	100	135	140	kHz	
Main Frequency		Fdclk	240	297	310	MHz	
Rush Current		I _{RUSH}	-	-	7	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD} .

(2) $f_v=120\text{Hz}$, $f_{DCLK}=297\text{MHz}$, $V_{DD}=12.0\text{V}$, DC Current.

(3) Power dissipation check pattern (LCD Module only)

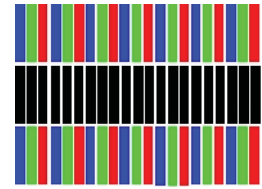
a) Black Pattern



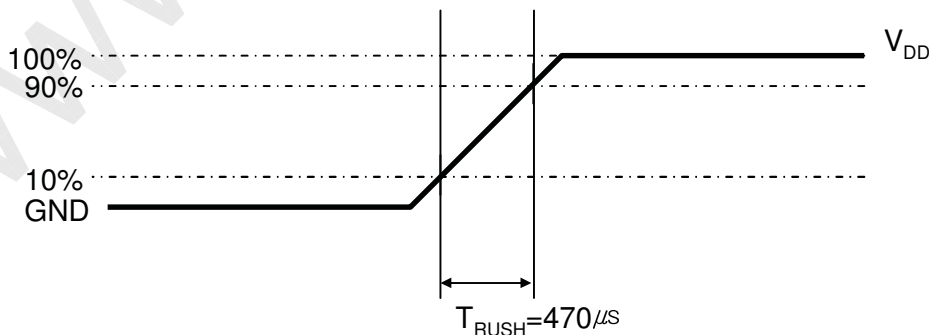
b) White Pattern



c) H-stripe



(4) Measurement Conditions



Rush Current I_{RUSH} can be measured when T_{RUSH} is $470\mu\text{s}$.

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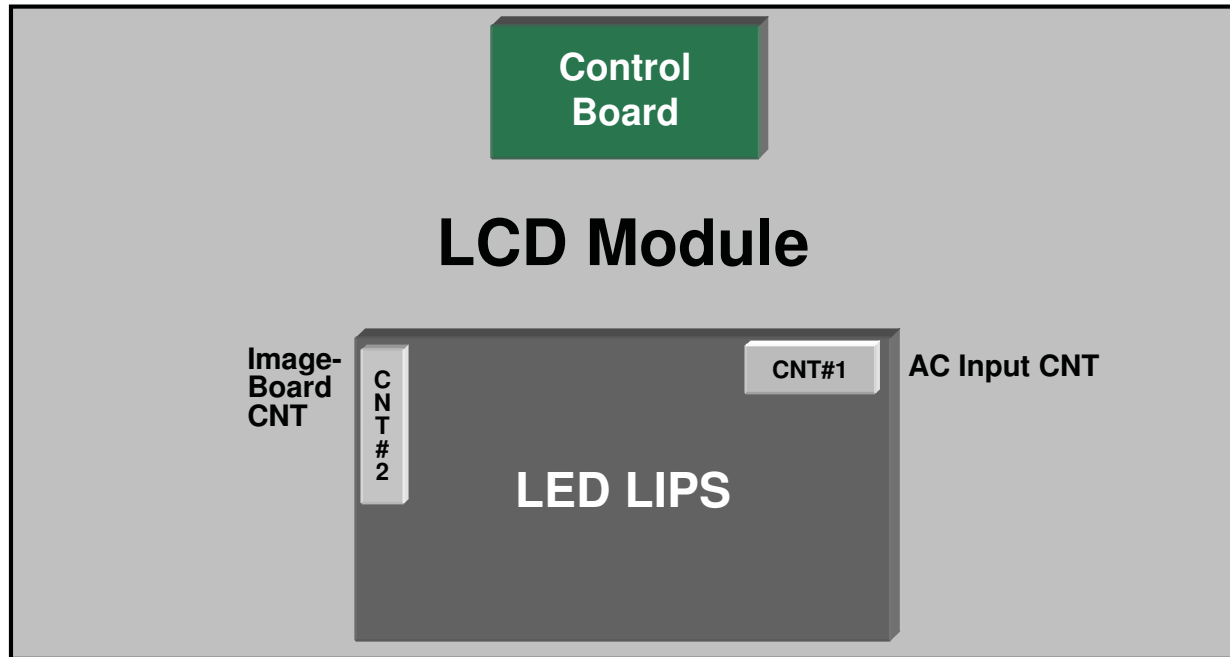
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3.2 Back Light Unit

The back light unit contains 372ea WLEDs (White Light Emitting Diode)

$T_a = 25 \pm 2^\circ\text{C}$



Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Life Time	Hr	30,000	-	-	Hour	(1)

Note (1) It is defined as the time to take until the brightness reduces to 50% of its original value.

[Operating condition : $T_a = 25 \pm 2^\circ\text{C}$]

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3.3 LED LIPS Condition & Specification

Items (1)		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Input	Voltage	V _{in}	-	90	-	264	V _{ac}	Ta=25±2 °C
	Current	I _{in}	V _{in} =90V	-	-	4.5	A _{rms}	
Output	+12V	-	V _{in} =100~240V _{ac}	11.4	12.0	12.6	V	Ta=25±2 °C
	Current		Ext_Dim=100%	-	110	-	mA _{rms}	(2)
	STB5.3V	-	V _{in} =100~240V _{ac}	5.0	5.3	5.5	V	Ta=25±2 °C
PS On/Off		ON	Floating	0.8	-	5.565	V	-
		OFF	Low(GND)	0	-	0.3		
BL On/Off		ON	Floating	0.8	-	5.565	V	-
		OFF	Low(GND)	0	-	0.3		
Dimming Control		Ext_Dim	V _{HIGH}	2.4	-	5.2	V	-
			V _{LOW}	0	-	0.8		
Dim Frequency		F _{PWM}	V _{in} =90~264V	120	-	200	Hz	-
PWM Duty		-	-	20	-	100	%	(3)

Note (1) All data is measured after 120min warm-up.

Note (2) Test Equipment

-DC current Probe : TCP312 (Tektronix)

-Oscilloscope : TDS5054 (Bandwidth 20MHz)

Note (3) PWM Duty(%) = (T_{on} / T_{total}) * 100

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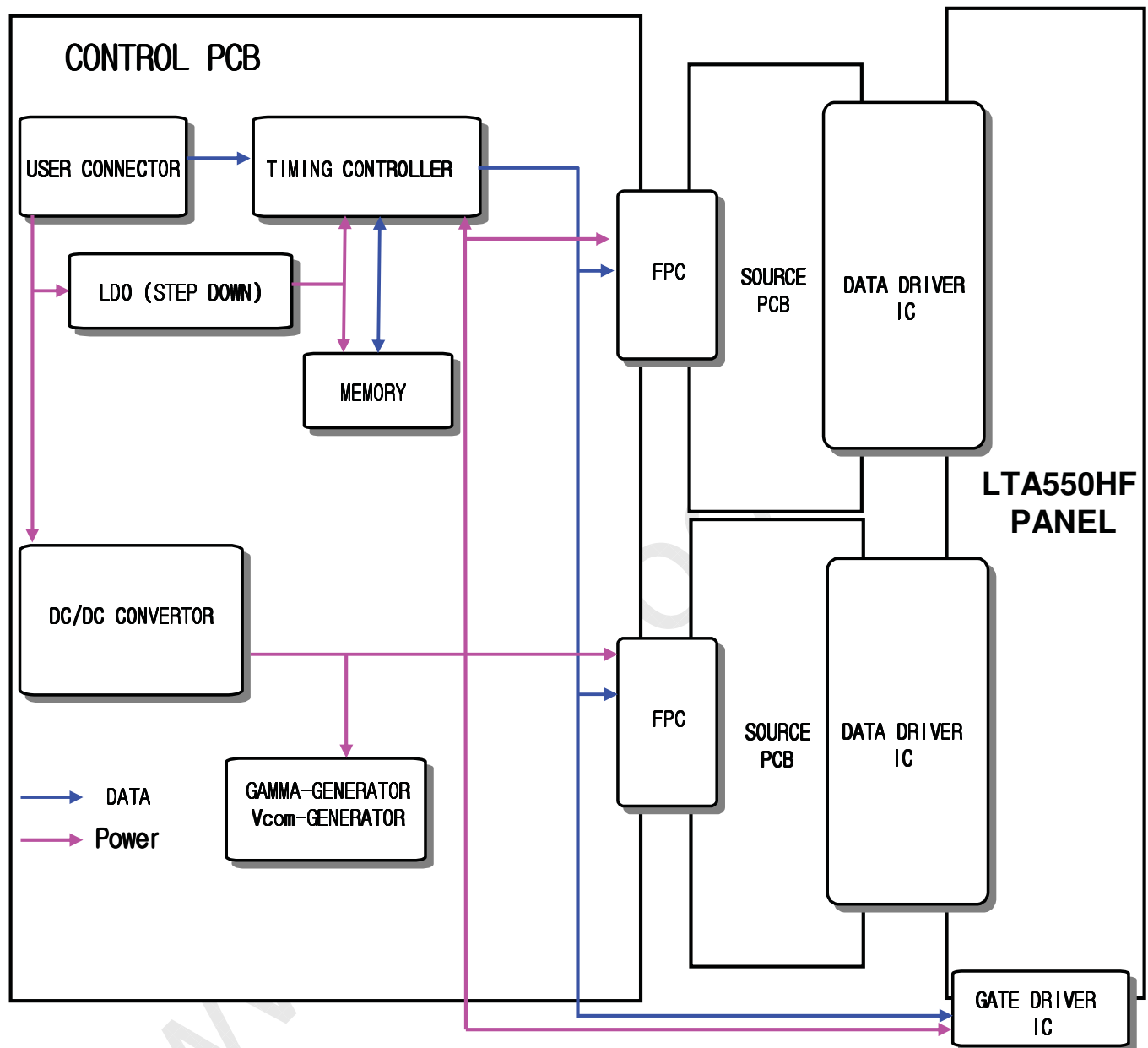
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4. Block Diagram



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5. Input Terminal Pin Assignment

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5.1. Input Signal & Power

Connector : FI-RE41S-HF (JAE)

Pin	Symbol	Description	Pin	Symbol	Description
1	12V	DC power supply	26	Rx3[0]P	3 rd , 7 th LVDS Signal +
2	12V	DC power supply	27	Rx3[1]N	3 rd , 7 th LVDS Signal -
3	12V	DC power supply	28	Rx3[1]P	3 rd , 7 th LVDS Signal +
4	12V	DC power supply	29	Rx3[2]N	3 rd , 7 th LVDS Signal -
5	12V	DC power supply	30	Rx3[2]P	3 rd , 7 th LVDS Signal +
6	NC	NOTE	31	GND	Ground
7	GND	Ground	32	Rx3CLK-	3 rd , 7 th LVDS Clock -
8	GND	Ground	33	Rx3CLK+	3 rd , 7 th LVDS Clock +
9	GND	Ground	34	GND	Ground
10	Rx1[0]N	1 st , 5 th LVDS Signal -	35	Rx3[3]N	3 rd , 7 th LVDS Signal -
11	Rx1[0]P	1 st , 5 th LVDS Signal +	36	Rx3[3]P	3 rd , 7 th LVDS Signal +
12	Rx1[1]N	1 st , 5 th LVDS Signal -	37	Rx3[4]N	3 rd , 7 th LVDS Signal -
13	Rx1[1]P	1 st , 5 th LVDS Signal +	38	Rx3[4]P	3 rd , 7 th LVDS Signal +
14	Rx1[2]N	1 st , 5 th LVDS Signal -	39	GND	Ground
15	Rx1[2]P	1 st , 5 th LVDS Signal +	40	NC	NOTE
16	GND	Ground	41	NC	
17	Rx1CLK-	1 st , 5 th LVDS Clock -			
18	Rx1CLK+	1 st , 5 th LVDS Clock +			
19	GND	Ground			
20	Rx1[3]N	1 st , 5 th LVDS Signal -			
21	Rx1[3]P	1 st , 5 th LVDS Signal +			
22	Rx1[4]N	1 st , 5 th LVDS Signal -			
23	Rx1[4]P	1 st , 5 th LVDS Signal +			
24	GND	Ground			
25	Rx3[0]N	3 rd , 7 th LVDS Signal -			

NOTE

NC(No Connection) : These PINS are used only for SAMSUNG . (DO NOT CONNECT)**MODEL****LTA550HF03****Doc. No****06-002-G-090706****Page****14 / 30**

5. Input Terminal Pin Assignment

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5.1. Input Signal & Power

Connector : FI-RE51S-HF (JAE)

Pin	Symbol	Description	Pin	Symbol	Description
1	12V	DC power supply	26	Rx4[0]P	4 th , 8 th LVDS Signal +
2	12V	DC power supply	27	Rx4[1]N	4 th , 8 th LVDS Signal -
3	12V	DC power supply	28	Rx4[1]P	4 th , 8 th LVDS Signal +
4	12V	DC power supply	29	Rx4[2]N	4 th , 8 th LVDS Signal -
5	12V	DC power supply	30	Rx4[2]P	4 th , 8 th LVDS Signal +
6	NC	NOTE1	31	GND	Ground
7	GND	Ground	32	Rx4CLK-	4 th , 8 th LVDS Clock -
8	GND	Ground	33	Rx4CLK+	4 th , 8 th LVDS Clock +
9	GND	Ground	34	GND	Ground
10	Rx2[0]N	2 nd , 6 th LVDS Signal -	35	Rx4[3]N	4 th , 8 th LVDS Signal -
11	Rx2[0]P	2 nd , 6 th LVDS Signal +	36	Rx4[3]P	4 th , 8 th LVDS Signal +
12	Rx2[1]N	2 nd , 6 th LVDS Signal -	37	Rx4[4]N	4 th , 8 th LVDS Signal -
13	Rx2[1]P	2 nd , 6 th LVDS Signal +	38	Rx4[4]P	4 th , 8 th LVDS Signal +
14	Rx2[2]N	2 nd , 6 th LVDS Signal -	39	GND	Ground
15	Rx2[2]P	2 nd , 6 th LVDS Signal +	40	NC	NOTE1
16	GND	Ground	41	NC	
17	Rx2CLK-	2 nd , 6 th LVDS Clock -	42	NC	
18	Rx2CLK+	2 nd , 6 th LVDS Clock +	43	NC	
19	GND	Ground	44	NC	
20	Rx2[3]N	2 nd , 6 th LVDS Signal -	45	LVDS_SEL	NOTE2
21	Rx2[3]P	2 nd , 6 th LVDS Signal +	46	NC	NOTE1
22	Rx2[4]N	2 nd , 6 th LVDS Signal -	47	NC	
23	Rx2[4]P	2 nd , 6 th LVDS Signal +	48	NC	
24	GND	Ground	49	NC	
25	Rx4[0]N	4 th , 8 th LVDS Signal -	50	NC	
			51	NC	

Note1) No Connection: These PINS are used only for SAMSUNG. (DO NOT CONNECT)

Note2) LVDS OPTION : If this PIN is HIGH (3.3 V) → Normal LVDS format

LOW (GND) → JEIDA LVDS format

SEQUENCE : On = $V_{DD}(T1) \geq \text{LVDS Option} \geq \text{Interface Signal}(T2)$

OFF = $\text{Interface Signal}(T3) \geq \text{LVDS Option} \geq V_{DD}$

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Note(1) Pin number starts from Left side

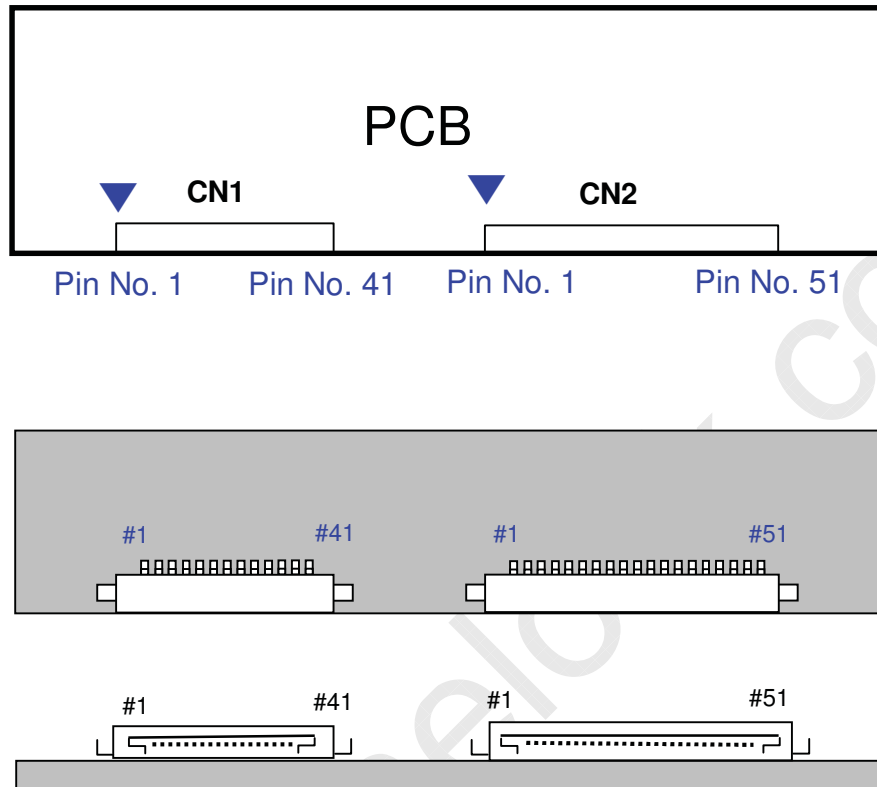


Fig. Connector diagram

- a. Power GND pins should be connected to the LCD's metal chassis.
- b. All power input pins should be connected together.
- c. All NC pin should be separated from other signal or power.

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5.2 LED LIPD AC Input Pin Configuration

Connector #1 : YAW396-03AV, 2pin (YEONHO)

Pin No.	Pin Configuration (FUNCTION)
1	AC-NEUTRAL
2	AC-LIVE (100V ~ 240V)

5.3 LED LIPS Input & Output Pin Configuration

Connector #2 : SMAW200-12C, 12pin (YEONHO)

Pin No.	Pin Configuration	FUNCTION
1	+12V	OUTPUT
2	+12V	OUTPUT
3	GND	
4	+12V	OUTPUT
5	GND	
6	GND	
7	STB 5.3V	OUTPUT
8	External Dimming Control [0V:Min / 5.2V:Max]	INPUT
9	GND	
10	PS_ON [ON : Floating, OFF : Low(GND)]	INPUT
11	No Connection (DO NOT CONNECT)	
12	BL_ON [ON : Floating, OFF : Low(GND)]	INPUT

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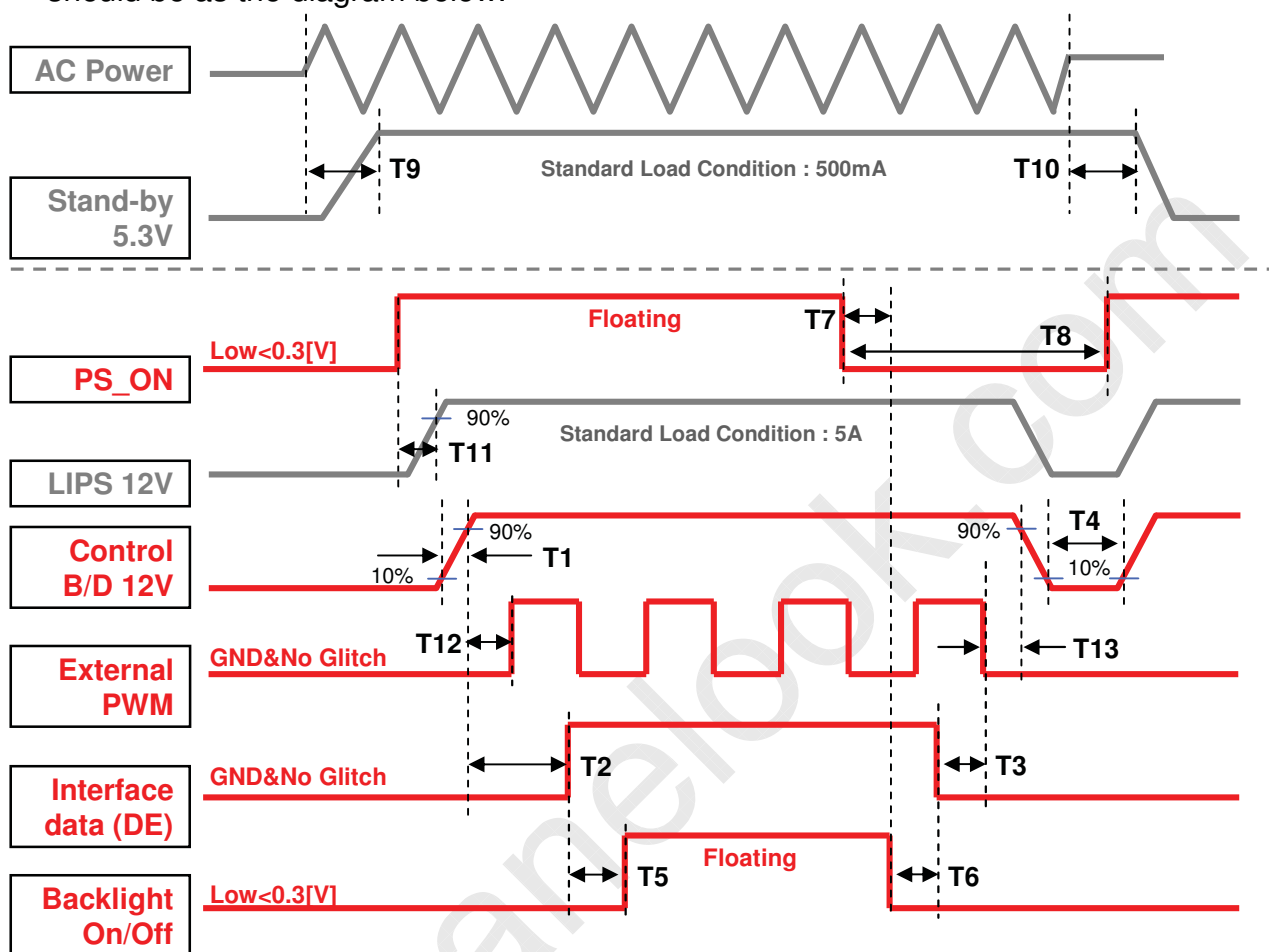
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5.4 LED LIPS Power ON/OFF Sequence

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Customer Side
: SEC Side

To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.



* [R] : Recommended value

Item	Specifications [ms]	Item	Specifications [ms]
T1	$0.5 < T1 \leq 10$	T8	$1500 \leq T8$ [R]
T2	$0 < T2 \leq 50$	T9	$0 < T9 \leq 400$
T3	$0 < T3 \leq 50$ [R]	T10	$T10 < 500$
T4	$1000 \leq T4$ [R]	T11	$0 < T11 \leq 400$
T5	$1000 \leq T5$ [R]	T12	$0 < T12 \leq T2$ [R]
T6	$100 \leq T6$ [R]	T13	$0 \leq T13 \leq 50$ [R]
T7	$T7 \leq 0$		

- When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- T9 and T10 should be measured with the standard load condition. (Stand-by 5.3V : 500mA)
- T11 should be measured with the standard load condition. (LIPs 12V : 5A)
- T4 should be measured after the Module has been fully discharged between power off and on period.
- The backlight signal must be ON, after Valid DE signal.
- The backlight signal must be OFF prior to Valid DE signal.

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5.5 LVDS Interface

- LVDS Receiver : Tcon (merged)
- Data Format (JEIDA)

	LVDS pin	JEIDA -DATA
TxOUT/RxIN0	TxIN/RxOUT0	R4
	TxIN/RxOUT1	R5
	TxIN/RxOUT2	R6
	TxIN/RxOUT3	R7
	TxIN/RxOUT4	R8
	TxIN/RxOUT6	R9
	TxIN/RxOUT7	G4
TxOUT/RxIN1	TxIN/RxOUT8	G5
	TxIN/RxOUT9	G6
	TxIN/RxOUT12	G7
	TxIN/RxOUT13	G8
	TxIN/RxOUT14	G9
	TxIN/RxOUT15	B4
	TxIN/RxOUT18	B5
TxOUT/RxIN2	TxIN/RxOUT19	B6
	TxIN/RxOUT20	B7
	TxIN/RxOUT21	B8
	TxIN/RxOUT22	B9
	TxIN/RxOUT24	HSYNC
	TxIN/RxOUT25	VSYNC
	TxIN/RxOUT26	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R2
	TxIN/RxOUT5	R3
	TxIN/RxOUT10	G2
	TxIN/RxOUT11	G3
	TxIN/RxOUT16	B2
	TxIN/RxOUT17	B3
	TxIN/RxOUT23	RESERVED
TxOUT/RxIN4	TxIN/RxOUT28	R0
	TxIN/RxOUT29	R1
	TxIN/RxOUT30	G0
	TxIN/RxOUT31	G1
	TxIN/RxOUT32	B0
	TxIN/RxOUT33	B1
	TxIN/RxOUT34	RESERVED

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5.6 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	DATA SIGNAL																											GRAY SCALE LEVEL
		RED									GREEN									BLUE									
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7				
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-		
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	-		
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	-		
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-		
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-		
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	-		
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	-		
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-		
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0		
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1		
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2		
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:				R3~ R252		
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:						
	↓ LIGHT	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253		
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254		
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255		
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0		
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1		
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2		
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:				G3~ G252		
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:						
	↓ LIGHT	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	G253		
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	G254		
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	G255		
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0		
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	B1		
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B2		
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:				B3~ B252		
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:						
	↓ LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253		
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B254		
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	B255		

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

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6. Interface Timing

6.1 Timing Parameters (DE only mode)

SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	240	297	310	MHz	-
Hsync		F_H	100	135	140	KHz	-
Vsync		F_V	90	120	125	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	1080	-	Lines	-
	Vertical Total	T_V	1090	1125	1380	Lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1920	-	Clocks	-
	Horizontal Total	T_H	2090	2200	2350	clocks	-

Note) This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

(1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system

(2) Internal $V_{DD} = 3.3V$

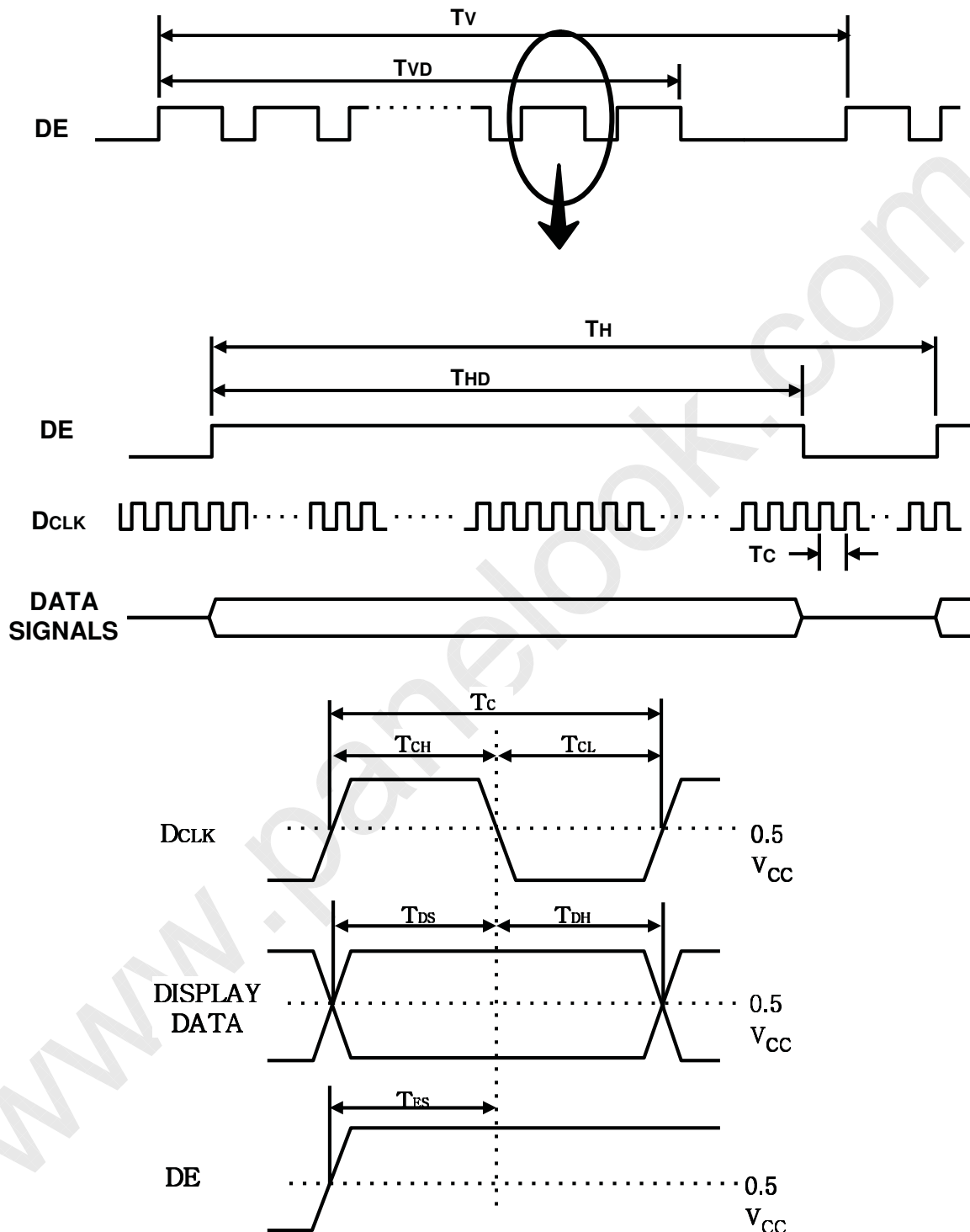
(3) Spread spectrum

- Modulation rate (max) : $\pm 1.5 \%$

- Modulation Frequency : under 100KHz

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6.2 Timing diagrams of interface signal (DE only mode)



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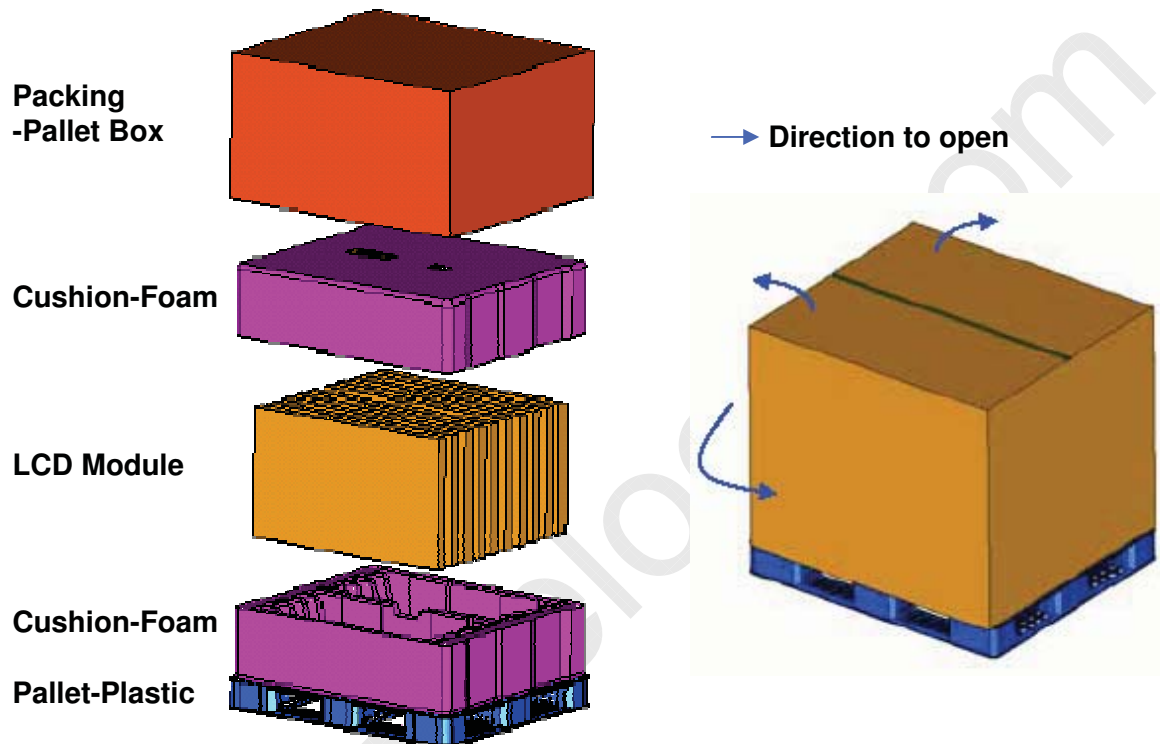
8. PACKING

8.1 CARTON (Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



8.2 Packing Specification

Item	Specification	Remark
LCD Packing	13ea / (Packing-Pallet Box)	1. 221 Kg / LCD (16ea) 2. 13.4 Kg / Cushion-pallet (2ea) 3. 10.5 Kg / Packing-Pallet Box (1ea) 4. Cushion-pallet Material : EPS 5. Packing-Pallet Box Material : DW4
Pallet	1Box / Pallet	1. Pallet weight = 10 kg
Packing Direction	Vertical	
Total Pallet Size	H x V x height	1475mm(H) x 1150mm(V) x 995mm(height)
Total Pallet Weight	255 kg	Pallet(10kg) + Module(221kg) + Cushion(up+bottom=13.4kg) + Pallet-BOX(11kg)

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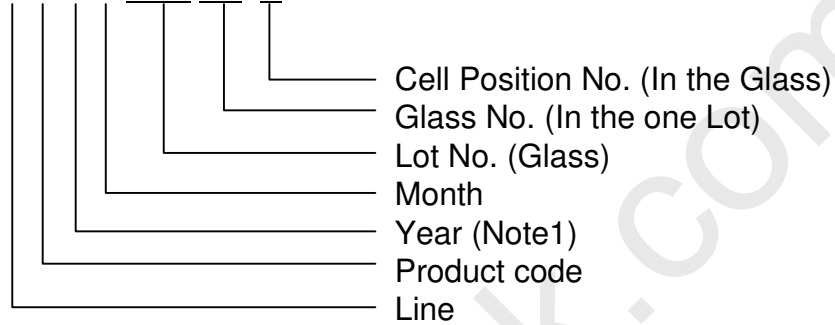
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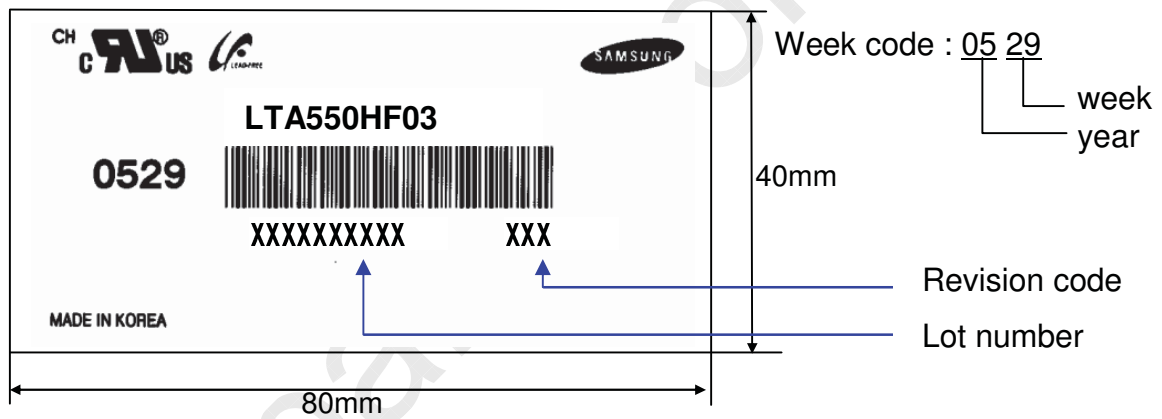
9. MARKING & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

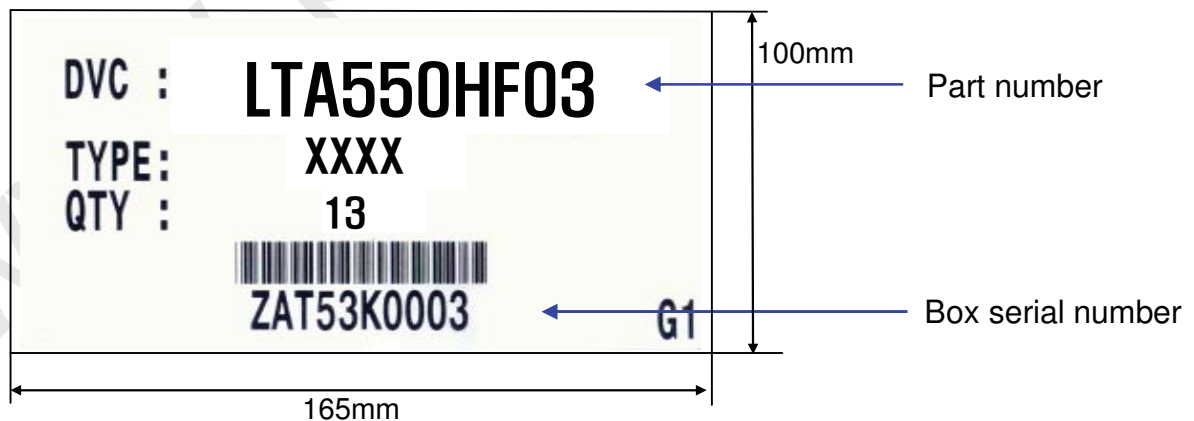
- (1) Part number : LTA550HF03
- (2) Revision: Three letters
- (3) Lot number : X X X X XXX XX X



(4) Nameplate Indication



(5) Packing box attach



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10. General Precautions

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10.1 Handling

- (a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.
- (b) Because the inverter use high voltage, it should be disconnected from power before it is assembled or disassembled.
- (c) Refrain from strong mechanical shock and / or any force to the Module.
In addition to damage, this may cause improper operation or damage to the Module and LED back light.
- (d) Note that polarizers are very fragile and could be damage easily.
Do not press or scratch the surface harder than a HB pencil lead.
- (e) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.
- (f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.
- (g) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane.
Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (h) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.
- (i) Protect the module from Electrostatic discharge. Otherwise the ASIC IC or Semiconductor would be damaged.
- (j) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (k) Do not disassemble the Module.
- (l) Do not disassemble shield case of inverter & LVDS board.
- (m) Do not connect N.C pins. (Samsung internal use only)
- (n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized. Must put on antistatic glove while handle a module
- (o) Pins of I/F connector should not be touched directly with bare hands.

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10.2 Storage

- (a) Do not leave the Module in high temperature, and high humidity for a long time. It is highly recommended to store the Module with temperature from 0 to 35℃ and relative humidity of less than 70%.
- (b) Do not store the TFT-LCD Module in direct sunlight.
- (c) The Module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storing.

10.3 Operation

- (a) Do not connect or disconnect the Module in the "Power On" condition.
- (b) Power supply should always be turned on/off by the "Power on/off sequence"
- (c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (d) The cable between the back light connector and its inverter power supply should be connected directly with a minimized length. A longer cable between the back light and the inverter may cause lower luminance of LED and may require higher startup voltage(Vs).

10.4 Operation Condition Guide

- (a) The LCD product should be operated under normal conditions.
Normal condition is defined as below;
 - Temperature : $20 \pm 15^{\circ}\text{C}$
 - Humidity : $55 \pm 20\%$
 - Display pattern : continually changing pattern (Not stationary)
- (b) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc., It is strongly recommended to contact SEC for Application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at Airports, Transit Stations, Banks, Stock market, and Controlling systems.

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10.5 Others

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- (a) Ultra-violet ray filter is necessary for outdoor operation.
- (b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- (c) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)
Otherwise the Module may be damaged.
- (d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked " to the screen.
To avoid image sticking, it is recommended to use a screen saver.
- (e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.
- (f) Please contact SEC in advance when you display the same pattern for a long time.

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